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The Relevance of Index Funds for Pension Investment in Equities

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The case for index funds is predicated on the observed inability of active managers to outperform market indexes over long periods. Agency conflicts between investors and fund managers are another important motivation, as index funds benefit from simple, unambiguous accountability.

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Summary findings

The rise of index funds over the past 25 years has been a remarkable phenomenon. The traditional rationale for the success of index funds is market efficiency, net of transaction costs. Shah and Fernandes also focus on the role of agency conflicts between fund managers and investors, which are hard to resolve, given the low power of statistical tests of performance.

Most of the empirical evidence about the superiority of index funds comes from the United States. Shah and Fernandes discuss issues associated with the application of index funds in developing countries, as well as policy issues in the financial sector that affect the enabling market infrastructure for index funds.

They also apply these ideas to thinking about the relevance of index funds for pension investment.

The equity premium provides powerful motivation for equity investment by pension funds. Index funds make it possible to sidestep the complexities of forming contracts and monitoring institutions to govern fund managers.

In developing countries that seek to use index funds in pension investment, there are avenues through which policymakers can make index funds more viable. In many countries there are significant avenues for improving construction of the market index as well as market mechanisms used in the equity market.

This paper—a product of Finance, Development Research Group—is part of a larger effort in the group to study the promotion of pension funds. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Agnes Yaptenco, room MC3-446, telephone 202-473-1823, fax 202-522-1155, email address ayaptenco@worldbank.org. Policy Research Working Papers are also posted on the Web at www.worldbank.org/research/workingpapers. November 2000. (31 pages)

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1. The idea of index funds[1]

In the decade of the 1960s and 1970s, many studies indicated that actively managed funds - which seek to obtain excess returns by actively forecasting returns on individual stocks - do not actually obtain statistically significant excess returns. This was consistent with the hypothesis of 'market efficiency', which suggested that obtaining excess returns should be difficult in a competitive market.

This research suggested a superior investment strategy: the index fund. This would be a portfolio which passively replicated the returns of the index. The most useful kind of market index is one where the weight attached to a stock is proportional to its market capitalisation. Index funds are easy to construct for this kind of index, since the index fund does not need to trade in response to price fluctuations. Trading is only required in response to issuance of shares, mergers, etc.

Table 1. The size of the indexation industry

It is safe to suggest that many smaller index fund managers, and many index funds outside the US, were missed out in this survey. Hence, the total size seen here is an underestimate, and the four-firm concentration ratio seen here is an overestimate.

	Assets under indexation ($ billion)				
Manager	Total	US Equity	US Bonds	Intnl. Equity	Intnl. Bonds
Barclays Global Investors	407	288	73	45	0.3
State Street Global	207	122	27	58	0.3
Bankers Trust	156	131	4	22	0.0
TIAA-CREF	96	84	0	12	0.0
Sum of above four	866	625	104	137	0.6
Total of 55 managers	1323	952	210	156	1.0
Four-firm concentration	65%	66%	50%	88%	60%

Source: A survey of index fund managers run by the magazine *Pensions & Investments*, February 22, 1999.

The first index fund dates back to 1972. In the following years, the indexation industry has grown at a dramatic pace. However, exact data about the size of the industry is hard to obtain. Some evidence about the size of the index fund industry is summarised in Table 1. Index funds are arguably one of the most successful ideas that have flowed from academic economics into the real world.

In an ideal world, where trading is frictionless and dividends are obtained by shareholders on the exact ex-dividend date, the index fund would exactly replicate the returns on the index (inclusive of dividends). A variety of events necessitate trading by the index fund: issuance of shares by a company (which raises the weight of the company in the index), addition or deletion of companies from the index, reinvestment of dividends, etc. In the real world, trading imposes transactions costs upon the index fund, and dividends are not obtained exactly on the ex-date.

When a security trades at an ``ideal" price of $p$, purchasers end up paying a slightly higher price $p_b$. The percentage degradation faced here, $100((p_b/\bar{p}) - 1)$, is called ``market impact cost". Index maintainers make their calculations assuming that all trading is done at zero market impact cost; index funds always suffer impact cost and thus generate inferior returns. Suppose we have a time-series of returns on an index (inclusive of dividends) of r_t, and the index fund experiences a time-series of returns of r_t'. Then the annualised standard deviation of $r_t - r_t'$ is termed ``tracking error".

Tracking error summarises the extent to which the index fund is able to accurately track the index. Index fund managers seek to minimise tracking error. From the viewpoint of an investor, an index fund which experiences a large tracking error is a source of risk since it might not replicate the returns on the index in the future.

2. The rationale for index funds

Traditional fund managment has been based on the premise that the fund manager adds value through his continuous efforts at improving risk-adjusted returns by forecasting returns. Index funds are counter-intuitive in that they make no such effort. The index fund manager makes no attempt at returns forecasting; his only goal is to replicate index returns. Why might index funds be more attractive? The arguments can be summarised under two basic issues:

Market efficiency If markets are fairly efficient, then it would prove difficult for active managers to obtain excess returns, after considering the higher fees and costs that they have to run up.

Agency problems The principal-agent problem between investors and money managers presents special difficulties owing to the unobservability of the fund managers ability and effort.

The relative ease with which the principal can monitor the fund management activities of the agent, in the context of index funds, is one factor which underlies the growth of index funds.

2.1 Does active management yield excess returns?

Table 2. Costs and expenses of equity funds

This table shows a comparison between the expenses and transactions costs incurred by actively managed funds, as compared with index funds.

	Large Cap US Equity	Large Cap Non-US Equity	Small Cap US Equity	Emerging Market Equity
Commissions, Taxes	0.07	0.28	0.25	0.51
Bid/Offer, Market Impact	0.23	0.50	0.75	1.08
Total Trade Cost	0.30	0.78	1.00	1.59
Turnover				
Active	150	150	150	150
Passive	8	10	50	20
Trade Cost				
Active	0.45	1.17	1.50	2.39
Passive	0.02	0.08	0.50	0.32
Management / Custody fees				
Active	0.45	0.55	0.75	1.20
Passive	0.05	0.20	0.08	0.55
Ongoing Costs				
Active	0.90	1.72	2.25	3.59
Passive	0.07	0.28	0.58	0.87
Difference	0.83	1.44	1.67	2.72

Source: Cheung (1999).

Active management is an attempt to obtain excess returns. In doing this, active managers have to expend resources on the enterprise of fund management, and have to incur transactions costs in trading.

Table 3. The coefficient of the "Index fund" dummy in regressions which explain the expense ratio

James et al. (1999) have a series of cross-sectional regressions exploring the determinants of the expense ratio in the Morningstar database.

These regressions control for the following variables: Assets, Squared assets, Average number of shareholders, Assets per shareholder, Assets in fund complex, three-year net return, three-year gross return, three-year standard deviation, dummies for five asset classes, a dummy variable if the fund targets institutional investors, the initial investment, variables expressing loads and the 12b1 fees (in the US), turnover, a dummy variable for advice from a bank, and fund age.

This table shows the results for the coefficient of the "Index fund" dummy (measured in basis points) in these regressions.

	Coefficient	t-statistic
1992	-18.93	-1.69
1993	-32.45	-3.12
1994	-41.66	-5.3
1995	-34.16	-4.8
1996	-38.31	-5.8
1997	-39.47	-8.9

Source: James et al. (1999)

Index funds feature lower expenses by avoiding the expenditures into information collection and information processing that is required in returns forecasting. Table 2 shows evidence about the expenses and fees of index funds as compared with actively managed funds, where index funds hold an advantage of 0.83 to 2.72 percent per year through lower expenses. Table 3 summarises some empirical evidence from James et al. (1999), using linear regressions which seek to explain the expense ratio of funds in the Morningstar database. After controlling for a variety of factors which influence expenses, we see that index funds incur lower expenses by around 30 to 40 basis points per year.

As a broad regularity, index funds tend to engage in smaller trading volumes as compared with actively managed funds, which also helps enhance returns through lower costs of transacting. Table 2 shows some US evidence about the transactions costs incurred by index funds as compared with actively managed funds, where index funds hold an advantage of between 0.43 to 2.07 percentage points per year through lower transactions costs.

We may note here that the large-cap stocks on the US stock market are amongst the largest companies in the world. The situation in many developing countries may be closer to the

evidence shown for the medium-cap and small-cap universes of the US stocks market.

In the fund industry, index funds are a highly contestable area owing to product standardisation. If an active manager (for example, Warren Buffet) is highly successful, and supports high fees, it is not clear how a competitor can offer a comparable competing product. In contrast, if one index fund on a given index commands high fees, it is easy for entrants to offer sharply comparable products and hence lead to a reduction in fees.

Low fees and expenses are not an end in themselves. The higher fees and expenses of actively managed funds might be justified if markets were inefficient enough so that excess returns were obtained, in excess of these fees and expenses. For example, the justification often cited for paying higher management fees and transactions costs in small-cap, illiquid asset classes is that the prospective returns are seen as being higher. Hence, the most important issue in evaluating index funds is the ultimate returns delivered to the investor, net of fees and expenses.

Table 4. A performance comparison: Evidence from the US over 1976-97

This table summarises the US experience about index funds as compared with actively managed funds. Over this 21-year period, the S&P 500 index outperformed the S&P 500 index fund by 0.4% per year, and it outperformed the average actively managed fund by 1.1 % per year.

Product	Average returns, 1976-97
Returns on S&P 500	15.2%
Returns on S&P 500 index fund	14.8%
Return on General Equity Funds	14.1%

Source: Figure 5 in Bogle (1998).

Table 5. Mutual funds which were outperformed by their respective indexes

In four major asset classes, we see that the predominant outcome was for the active fund to underperform its benchmark index. This regularity holds for equities invested outside the US and in developing countries also.

Category	Benchmark Index	Period	Fraction of funds which underperformed
General equity funds	Wilshire 5000 Index	1986-95	65%
International equity funds	MSCI-EAFE Index	1986-95	73%
Emerging markets funds	MSCI-Emerging Markets	1993-95	88%
Bond funds	Lehman Brothers Bond Index	1986-95	77%

Source: Lipper Analytical Services

Table 6. Performance of the median active manager when compared with indexes.

Performance over the five-year period, ending on 31 December 1998, of the median active manager as compared with the market index. For example, in the universe of emerging market equity, the median manager lost 8.23%, while the index lost 8.7%, so the median manager was 47 basis points ahead.

Category	Median Manager	Index	Difference
U.S. Equity (S&P 500)	21.97	24.15	-2.18
U.S. Smallcap (Russell 2000)	15.20	11.86	3.34
Non-U.S. Equity (MSCI EAFE)	10.46	9.50	0.96
Emerging Markets (IFC Composite)	-8.23	-8.70	0.47

Source: Frank Russell, cited in Cheung (1999).

The historical experience with index funds as opposed to active managers is summarised in Table 4, Table 5 and Table 6. Table 4 shows that the index fund in the US lagged behind index returns by 40 basis points; however actively managed funds lagged behind index returns by a larger margin of 110 basis points. In Table 5, we see that in four major asset classes, the majority of actively managed funds proved to lag behind their benchmark indexes. This includes two categories outside the US: the classes of ``international equity" and ``emerging markets" investments.[3]

2.2 Agency problems

We can obtain important insights into the appeal of index funds by focusing on the principal-agent relationship between the investor and the fund manager. How is the investor to choose among competing fund managers? How is the agent to monitor the fund manager, and ensure that the actions of the fund manager are in his best interest?

Fund management is a complex process, in which agency problems could surface at many levels. There are many decisions where the fund manager could choose to act in ways which are not in the best interest of the investor (Shah, 1999). For instance:

The fund manager could choose to buy stocks in which he has a personal interest. Sometimes, fund managers allow the assets of the fund to be used by manipulative cartels, for which they may receive private benefits.

The fund manager could ``front-run" against the fund; buying stocks on his personal account immediately before doing so on behalf of the fund.

The fund manager could choose trading mechanisms which yield superior private rents instead of choosing the trading mechanism which yields the lowest transactions costs.

The fund manager has choices about custodial and administrative services which might not be made in a cost-minimising fashion.

It is difficult for an investor, or for a trustee, to closely monitor the fund manager and ensure that these decisions are being made in his best interest. Hence, the prominent device through which control can be exercised is by monitoring performance. The investor would select fund managers who have exhibited the highest returns in the past, and fire fund managers who fail to perform.

A naive comparison of returns across alternative funds is an inefficient way to measure fund manager ability when there are differences in the levels of risk adopted by different funds. The inherent randomness of market returns suggests that a casual comparison of returns should give way to a formal statistical test in comparing fund managers. This leads us to the enterprise of scientific performance evaluation efforts.

Mutual fund performance evaluation as yet suffers from many conceptual difficulties (Roll, 1977). In addition, the statistical efficiency of existing performance evaluation procedures is limited owing to the poor signal-to-noise ratio whereby genuine ability in fund management tends to get drowned in the noise of market fluctuations. At page 735 of Bodie et al. (1989), we see an example of a fund manager who has substantial skill - he adds returns of 0.2 percentage points per month (i.e., is in excess of 2.4 percentage points per year). It turns out that if the standard procedure of measuring the `alpha' of the fund manager were employed using monthly returns, we would need to observe the results of his fund managment for 32 years before we can reject the null hypothesis of no ability ($\alpha=0$) at a 95% level of significance.[4] This makes it difficult for investors to identify and adequately monitor fund managers. We may note here that this signal-to-noise ratio would be at its worst in developing countries, where stock market returns tend to be more volatile.

This poor signal-to-noise ratio becomes a particularly contentious issue when anyone other than an individual makes decisions about the choice of a fund manager for the individual. Consider a situation where a pension fund committee selects an active fund manager:

This poor signal-to-noise ratio reduces the ability of the committee to identify the manager with the best ability. When ability is relatively hard to measure, there is a greater role for political lobbying in determining the choice of the manager. Alternatively, signals such as pedigree, size or years of experience are often used as proxies for ability; this reduces the contestability of the market for money management services.[5]

Once a manager is chosen, suppose the returns prove to be below the index at a future date. The pension fund committee would then be relatively vulnerable to accusations of having chosen the wrong fund manager. This factor also generates a bias towards hiring fund managers who fare well on signals such as pedigree, size or years of experience, which helps the committee to produce a plausible defence for their actions in the future, if the need arises.

The literature on performance evaluation has posed a significant challenge to the proposition, held by all active managers, that the active manager is capable of adding value. In similar fashion, there are legitimate concerns about the proposition, held by most sponsors, that the plan sponsor is capable of selecting the active manager(s) who will add value in the future.

These problems are an important motivation for the growth of index funds, particularly in situations like pension investment. Comparing alternative index fund managers is relatively straightforward - it essentially reduces to comparing the tracking error that they have produced. It also makes it easier for individuals to obtain accountability from an institution such as a pension committee: poor asset returns should be directly linked up to poor returns on the index.

3. The mechanics of index funds

The stereotypical view of index funds is that their management is a trivial task. Yet, in practice, there are significant challenges in the creation and operations of an index fund.

Unlike active managers, who make no promises about future returns, index funds promise to replicate the returns of a publicly observable index. If the index rises by 20%, and if the index fund reports 19% returns, then the investor is entitled to be suspicious about how a hundred basis points of returns were lost. Index fund management is a challenge because of this level of scrutiny and accountability.

3.1 Choice and construction of index

In many countries, `widely prevalent' stock market indexes exist. In this case, the modern development of the financial sector, in the direction of index funds or index derivatives, almost automatically proceeds using these widely prevalent indexes. These market indexes often present a host of awkward difficulties in modern applications.

In most cases, these market indexes were created years ago, in an environment with limited information access, poor computation, and limited knowledge of financial economics. All three factors are much altered today. Modern electronic stock exchanges, which use anonymous trading with computerised order matching, offer a wealth of information about market liquidity. The revolution in computational power at ever-lower prices has made it possible to embed complex computational procedures into day to day index management. Finally, research into index funds and index derivatives through the decade of the 1980s and 1990s has shed new light upon the issues in index construction.

The difficulties with many traditional stock market indexes may be summarised as follows:

When some stocks in the index are inadequately liquid, this contaminates the information represented by the index, and makes it harder to use the index for financial products such as index funds or index futures.

An illiquid stock contaminates the information content of the index via `stale prices', where the computation of the index at time t_2 is forced to use information about a trade on an illiquid stock at t_1, $t_1 < t_2$.

Illiquid stocks make it difficult to trade the entire index as a portfolio, and significantly hamper the viability of index funds and index derivatives. For example, it is fairly inconvenient to undertake program trades for all 500 components of the S&P 500 index, and approximation of the index using 150-300 stocks is a common procedure. Similarly, stock market indexes for

developing countries created by agencies such as IFC are often highly impractical when it comes to using them for index funds or index futures.

The procedures for `managing' the stock market index often leave much to be desired. The composition of an index should evolve over the years, reflecting changes in the economy, and the procedures through which this takes place should be immune to special interests. Many traditional index maintainers have proved to be weak on this count. In many countries, index maintainers do not even produce a variant of the market index inclusive of dividends.

Every stock market index is a tradeoff between diversification and liquidity. Small market indexes tend to be illiquid and under-diversified; large market indexes tend to be well-diversified and illiquid. Yet, there are sharply diminishing returns to diversification. Most randomly chosen portfolios in a country prove to be extremely highly correlated with each other, as long as they are highly diversified. Hence, as long as adequate diversification is obtained, the identity of specific stocks in the index is not too important as far as the risk/return character of the index is concerned.

Table 7. Impact cost in portfolio trades for alternative stock market indexes in India

Average impact cost (in percent), in 1997, on India's National Stock Exchange (NSE), for doing program trades for alternative stock market indexes. The NSE-50 index, which explicitly factors market impact cost into the index construction, proves to have significantly lower market impact cost.

Index	Market Cap. (Rs. Trillion)	Impact Cost (%) at trans. size (Rs. Mln)		
		5	10	20
BSE-30	1.96	0.35	0.46	0.67
Barings India Index	1.59	0.29	0.36	0.50
IFC India Index	2.62	0.53	0.65	0.89
MSCI India Index	2.67	0.53	0.64	0.87
NSE-50	2.21	0.29	0.36	0.49

Source: Author's calculations.

Hence, Shah & Thomas (1998) suggest that choosing highly liquid stocks, to form a well-diversified index, could be a useful strategy. There are two aspects to market liquidity: *market impact cost* (the degradation in price faced when placing a market order) and *market resiliency* (the time taken for the market to revert to its original state after an order is placed). Measuring and characterising market resiliency is, as yet, a unsolved research problem. However, on electronic exchanges, market impact cost can be accurately measured. Shah & Thomas (1998) use this in their method for index construction. Table 7, which is from their paper, summarises the market impact cost in doing program trades on alternative indexes in India. The NSE-50

index, where low market impact cost in doing index program trades is explicitly a goal, proves to have substantially lower market impact cost as compared with alternative indexes.[6]

Stock market indexes which use methods such as these would be well suited for the implementation of index funds and index derivatives. The reduced market impact cost when doing program trades on the index lead to reduced tracking error for index funds.

Table 8. Trading costs on spot market for some market indexes

This table shows the transactions costs faced in buying index baskets for some alternative market indexes. These numbers assume that the basket is traded over a maximum of one day.

Index	Basket size ($ million)	Commission (%)	Market impact cost (%)	Total (%)
US: S&P 500	5	0.057	0.150	0.207
US: S&P 500 futures	100	0.005	0.012	0.017
US: S&P Midcap	5	0.100	0.300	0.400
US: Russell 2000	5	0.150	0.655	0.805
India: NSE-50	5	0.200	0.250	0.450
India: Nifty Junior	2	0.200	0.800	1.000

Source: US data from Exhibit 3 of Chiang (1998) and page 756 of Mason et al. (1995); Indian data from author's experiences (1999).

Table 8 gives an international perspective on the transactions costs faced in doing program trades on a given index. In each case, it is assumed that a series of trades are done through one trading day, in order to buy the desired `basket size'. In the US, the spot market supports transactions of around $5 million with a total cost of 0.21%. When the index futures market is used, the size of the basket rises to $100 million and the cost drops to one-twelfth of this. The costs faced in obtaining baskets of less liquid stock market indexes, such as the S&P Midcap or the Russell 2000, are much higher. In a developing country, India, the main stock market index (NSE-50) supports much smaller basket sizes: around $5 million can be obtained in a day at a market impact cost of 0.25%. The next tier of less liquid stocks in India, the Nifty Junior index, faces a higher market impact cost of 0.8% for obtaining $2 million in a day.

Table 9. Tracking error for synthetic index funds

This table compares the annualised tracking error obtained with a synthetic index fund, using three alternative indexes for each country.

	Annualised tracking error		
Index	Local	FT/S&P	MSCI
TSE 35	2.92	5.26	5.58
Nikkei 225	3.06	7.14	8.20
Nikkei 300	2.61	2.97	2.92
TOPIX	2.94	3.14	4.24
Hang Seng	5.20	7.06	6.88
All Ords	3.11	3.52	4.25
STOXX 50	2.76	3.66	3.75
Euro STOXX 50	2.82	4.50	4.25
FTSE 100	2.25	2.54	2.50
CAC 40	1.59	3.47	2.80
DAX	1.17	3.54	4.39
SMI	1.10	2.06	2.51
AEX	1.30	4.70	6.34
IBEX 35	2.37	2.58	2.91
MIB 30	2.00	3.55	3.74
OMX	2.18	3.67	3.11

Source: Table 4 (page 5) from Goldman Sachs Equity Derivatives Research (1999).

Some related evidence on the importance of index construction is presented in Table 9, which summarises the tracking error obtained by the ``synthetic index fund" strategy using alternative indexes. In all countries, the local index yields a lower tracking error than the FT/S&P indexes or the MSCI indexes. The reasons for this are not immediately apparent; it may be because local indexes are more sensitive to local market liquidity. Regardless of the sources of this difference in tracking error, this evidence underlines the importance of local indexes as a vehicle for index funds and index futures.

3.2 Methods of implementing index funds

At first glance, implementing an index fund appears straightforward: the index fund is supposed to buy stocks with the correct weights, and trade in response to changes in the index set or when any of the index stocks issue new capital. In practice, implementing index funds proves to be a significant challenge, especially when the underlying stock market index has been poorly designed. Liesching & Manchanda (1990) is a survey of these techniques.

The simplest method through which index funds are implemented is ``full replication", where the portfolio held by the index fund is the same as the index. Such an index fund will replicate the returns of the index, subject to the caveat of transactions costs in trading.

Many countries have market indexes with design flaws, and one of the commonest problems is that of a market index which contains stocks which are highly illiquid. Sometimes, a market index for a sector innately suffers from high transactions costs in trading when the entire sector is only made up of illiquid stocks. When some or all index components are inadequately liquid, index funds which use full replication can suffer from a large tracking error owing to the large transactions costs faced in trading the entire index. One path for the implementation of an index fund, in this situation, consists of holding a portfolio p' which is different from the index portfolio p where: (a) the transactions costs associated with implementing p' are much lower than those faced with the true index p, and (b) the correlation between p and p' is high. In general, the portfolio p' should be chosen by explicitly solving a mathematical programming problem to minimise the tracking error.[7] If the liquidity of index components is sufficiently `unbalanced', where some components are disproportionately more liquid than others, such an index fund might obtain a lower tracking error as compared with a fund which uses full replication.[8]

The third strategy for implementing an index fund is to utilise stock index futures. Suppose an index futures product requires placing $x of collateral to support a position of $100. Then it is possible to replicate the returns on an index portfolio worth $100 by adopting a long position on the index futures market for $100, and investing the residual cash 100-x in riskless government securities (Mason et al., 1995). This is called the ``synthetic index fund". In the US, which has the most liquid index futures market in the world, the synthetic index fund has an annualised tracking error of around 0.46% (Goldman Sachs Equity Derivatives Research, 1999).

In most markets, this yields slightly higher returns than the index for two reasons: (a) the rate of return embedded in the index futures basis is slightly higher than the riskless rate of return, owing to the credit risk of the futures clearing corporation, and (b) the residual cash 100 - x is often invested in slightly risky securities, such as short-rated AAA corporate bonds, which yields slightly higher returns.

3.3 Evaluating the alternative implementation strategies

Full replication is feasible when the liquidity of the stocks that make up the index supports low-cost program trades on the complete index. The methods for index construction in Shah & Thomas (1998) are oriented towards index funds implemented through full replication. Full replication requires the least sophistication in terms of analytical and computational abilities in the fund industry.

When stock market indexes suffer from illiquid index components, optimisation-strategies can be useful; however, they require considerable sophistication in terms of quantitative finance.

When liquid index futures markets are available, synthetic index funds are often an excellent option. In mature markets, the transactions costs faced when trading the index using the index futures market can be as low as one-tenth to one-twentieth of the transactions costs faced when trading shares on the spot market. Holding a position on index futures involves lower custodial and administrative costs, especially in markets with primitive settlement systems where physical share certificates are still in use. On the flip side, the index futures implementation will forgo revenues from stocklending which the full replication fund enjoys.

Implementation through index futures is particularly attractive when the market index suffers from disproportionately illiquid index components: the index futures market offers a single, liquid, tradeable product. The user of the futures market would be relatively shielded from the illiquid index components.

The weaknesses of this implementation strategy are two-fold:

- The first problem is that index futures contracts expire, and the index fund would need to re-establish this position on the next available contract, a process called ``rollover''. If an index fund has assets of $100 billion, it would need to execute trades worth either $100 billion or $200 billion on the index futures market every few months. This is in sharp contrast with an index fund which is implemented using full replication: a fund with assets of $100 billion would typically undertake trading volume of one to five billion dollars in a year. Large index funds would suffer considerable transactions costs when doing this rollover, for even the highly liquid index futures markets are not adequately liquid to support such large transactions. Hence, the largest of index funds have often been limited to full replication strategies. There is an element of active management in the rollover process. If a rollover can be timed carefully for an instant in time when the near contract is expensive and a far contract is cheap, then the rollover can actually yield excess returns. However, this gives us an element of active management, and is inconsistent with the goals of index funds.

- Further, at the level of the economy, the index futures implementation has a basic weakness since index futures are in ``net zero supply'': for each buyer of a futures, there has to be an equal and opposite seller. If we think of 50% of the GDP of a country being invested in index funds using index futures, it will prove to be hard to find sellers who would be at the opposite end of the trades (Rubinstein, 1989). If index futures markets are used by index funds on this scale, we could observe breakdowns in the market efficiency of the index futures market and enhanced tracking error for these index funds.

In the real-world, all three implementation strategies have a useful role to play, depending upon the situation. Ideally, if index construction is done soundly in a country, then full replication should be the mainstream implementation strategy used by the bulk of indexed assets. Index futures are often attractive for individual index fund products, but considerations of

the economy as a whole (as in the context of the pension sector) relegate implementation strategies using index futures to the margin, in efficiently coping with incremental assets moving in or out of index funds. Optimisation-based strategies could be useful for extending the universe of indexation beyond the most liquid assets, or when faced with badly designed market indexes.

4. The enabling market infrastructure for index funds

The conventional analysis of index funds is generally based on treating the stock market index and the equity market as a given, and analysing the usefulness and implementation of index funds. For example, in the US, the S&P 500 as an index, and trading based on the `specialist' on the New York Stock Exchange as a market design, have existed for many decades; research on index funds in this context has treated the S&P 500 and the NYSE as givens.

From a policy perspective, it is useful to view the question from a different perspective: What is a market infrastructure which can best enable index funds? What aspects of the design of the financial system can be modified in a way which helps the implementation and usefulness of index funds?

4.1 Index

The most basic foundation of indexation is the stock market index. The treatment of index construction, in Section 3.1, suggests that there are significant gains to redesigning market indexes using modern knowledge of financial economics, especially in countries with modern market infrastructure in the form of electronic order-matching.

Unfortunately, market indexes which have existed for decades are hard to displace from the public imagination. Even in a country with nearly 100% literacy, the poorly designed `Dow Jones' index plays an important role. Yet, in many developing countries, where existing market indexes are not well respected, there are opportunities for successfully introducing a new index, even today. Policy makers can play a role in this migration out of legacy indexes.

4.2 Electronic trading

Implementing index funds obviously relies on an exchange where orders are executed. Prior to modern technology, a variety of market mechanisms have developed to address this problem: these include the `specialist' of the New York Stock Exchange, the `dealers' of NASDAQ, the floor with `open outcry' at the futures exchanges in Chicago, etc.

From the early 1970s onwards (Black, 1971), an important new idea has come to the centre stage of market design, this is the idea of using a computer to match orders in a market where economic agents *anonymously* post prices and quantities that they desire. This has also been termed the `open electronic limit order book' (OELOB) market. It has significant theoretical appeal (Glosten, 1994), and is the dominant form of market organisation that has been employed by exchanges worldwide in the decade of the 1990s. In recent years, the research community has been able to obtain fresh insights into market liquidity on the OELOB market (Handa et al., 1998).

After a decade of debate and resistence, many traditional exchanges have moved from a market design that was labour-intensive to the electronic exchange (for example, the London Stock Exchange (LSE) in 1997, and the London International Financial Futures Exchange (LIFFE) in 1998).

In labour-intensive markets, a `program trade' is difficult to execute, since human reaction time has low mean and high variance. If an index containing 100 stocks has to be purchased, it would require interacting with 100 (or more) humans. This is a complex and expensive affair. Even today, on the NYSE, executing program trades for the S&P 500 takes around two minutes; the index trader is exposed to the risk of market fluctuations within this time interval. In contrast, electronic exchanges make it convenient and efficient to place program trades. It is possible for an electronic exchange to execute 100 orders in a very short time, thus reducing the tracking error that results from purchases that are spread over different index levels.

The open electronic limit order book market is particularly valuable for index funds since it is transparent about prices *and liquidity*. An entire program trade can be priced before it is placed.[9] This is in sharp contrast with a traditional market such as the New York Stock Exchange, where every program trade results in an unpredictable execution.

While the implementation of equity index funds, worldwide, has been greatly enabled by the spread of electronic exchanges in the decade of 1990s, most bond markets continue to use primitive market institutions. This is a significant hurdle to the growth of bond index funds.

4.3 Call auctions

The ``call auction'' is a uniform price double auction where buyers and sellers compete in offering buy and sell prices for a stated interval of time (Handa & Schwartz, 1996; Economides & Schwartz, 1995). It is a trading procedure which aggregates the order flow over a period of time to produce greater liquidity, and allows all buyers and sellers to obtain a single price (there is no `market impact cost' in the electronic call auction).

Three examples of the use of the call auction can be cited:

1. The NYSE `opening price' is obtained using (manual) call auctions on each of the underlying stocks. This makes it convenient for program trading to take place at the NYSE open. Market orders which are placed in the call auctions are guaranteed to obtain the exact opening index level. For this reason, the S&P 500 futures settlement price is derived from the NYSE opening price of the *next day* after trading on the futures market has stopped.

2. The Arizona Stock Exchange (`http://www.azx.com`) is a stock exchange which exclusively relies on electronic call auctions.

3. In India, the National Stock Exchange (NSE) starts and ends the day using an electronic call auction. This ensures that the opening and closing levels of the index can be attained by index traders at zero impact cost.

To the extent that index funds are able to execute program trades at zero impact cost using call auctions, it reduces the tracking error faced by them.

4.4 Index futures

Index futures reduce the transactions costs of doing large index trades. As seen in Table 8, execution of basket trades for twenty times the basket size in the US takes place at one-twelfth the cost. This clearly suggests that index futures have a major role to play in implementing index funds. To the extent that a country has a functioning index futures market, it would assist index funds in obtaining lower tracking error.

5. Negative externalities of indexation

The worldwide growth of index funds in recent decades has raised concerns about the externalities that this rise of indexation could impose upon the economy. These concerns are in four areas: (a) distorted cost of capital for index stocks, (b) inferior corporate governance, (c) diminished market efficiency, and (d) enhanced concentration in the fund industry.

5.1 Distorted prices of index stocks

Many observers have expressed concerns about index funds `blindly' buying index stocks. If $100 billion are in index funds on a given index, and if a stock enters the index with a weightage of 0.5%, then index funds would be forced to buy $500 million of this stock. Conversely, index funds would be forced to sell shares of companies that are dropped from the index.

Could these activities significantly distort share prices? Do they result in elevated valuations, and hence an unusually low cost of capital, for index stocks? Does the growth of index funds thus contaminate the resource allocation produced by the stock market?

While these concerns may appear intuitively sound, they should be interpreted in the context of the actions of the rest of the market. If index funds purchased $500 million of a given stock, and if the price of the stock rose above a `fair valuation', then many informed speculators would choose to sell that stock. If markets were efficient, we would see a reshuffling in the ownership pattern of the company, with many shares going from informed speculators into index funds; however in the ideal efficient market, the impact on prices should be 0.

Table 10: Abnormal price fluctuations owing to inclusion/exclusion in the S&P 500 index

Evidence about abnormal stock price movements associated with addition or deletion from the S&P 500 index in the US. The trading by index funds seeking to do full replication would have to be fully completed by the ``effective date".

	(% change in stock price)	
	Addition	Deletion
From announcement date		
to effective date	+3.8	-12.7
From effective date to		
ten days after	-2.3	+6.2

Source: Lynch & Mendenhall (1997)

The event of addition or deletion of stocks from the S&P 500 index, with large index funds in the background, has given researchers many opportunities to study these effects, starting from the early work of Shleifer (1986) and Harris & Gurel (1986). The evidence, from Lynch & Mendenhall (1997), is summarised in Table 10. When Standard & Poors announces that a stock is added in the index, a future date where this announcement takes effect, called the ``effective date" is announced in advance. Index funds who seek to do full replication would be forced to buy the stock by this date. From the announcement to this ``effective date", an abnormal price movement of +3.8% is observed; however 2.3% of this is lost in the following ten days. Hence, the long-term price of inclusion in the S&P 500 is +1.5%. While this is a clear violation of market efficiency, it appears fairly benign in terms of not constituting a large distortion of stock prices or the cost of capital.

The evidence is less benign in the case of stocks which are dropped from the index: the selling by index funds generates a temporary drop of 12.7%, of which 6.2% is regained in the following ten days. The permanent drop in price amounts to 6.5%.

Hence, there *is* evidence that in a world with large indexed assets, the prices and hence cost of capital of stocks is distorted depending on inclusion or exclusion from the index. However, these effects do not appear to be very large.

5.2 Inferior corporate governance

Some observers have criticised index funds on the grounds that index fund managers do not take interest in resolving the agency conflicts between shareholders and managers. Index funds are viewed as free-riders on the corporate governance problem that other agents in the other economy are expending resources upon.

This free-rider problem is present with any investor who chooses to ignore corporate governance issues. The very logic of the limited liability company is that it gives shareholders the right, and not the obligation, to vote.

We can view failures of corporate governance as a violation of market efficiency. If a firm is producing inferior cashflows owing to improper incentives for managers, then there is an opportunity for an active portfolio manager to seize control of the company, modify the activities of the company so as to attain higher cashflows, and benefit from these activities to the extent that the share price of the company goes up. The existence of these situations, and the importance of speculators who engage in such activities, is undeniable.

5.3 Diminished market efficiency

Index funds are criticised for not engaging in stock speculation, in making forecasts about future returns, buying `undervalued' stocks and vice versa. If, in principle, the entire economy shifted to index funds, then market efficiency would undoubtedly deteriorate drastically. This is somewhat related to the previous issue; if the entire economy shifted to index funds, agency problems would be exacerbated.

It is useful to view index funds as the product of an equilibrium. In a world where numerous economic agents compete for speculative profits, a state approaching market efficiency is obtained. Index funds are useful in this state. The appeal of index funds is closely related to the extent to which competition between speculators makes it difficult to obtain excess returns from active management.

If, in a country, there were ``too few" speculators and ``too many" index investors, then the rates of return in active management would significantly exceed those obtained through indexation. As of yet, we have probably not encountered this situation in any country.

5.4 Concentration in the fund industry

Earlier, in Section 2.2, we commented on the role of signals such as pedigree, size and years of experience as proxies for fund management ability, in a world where it is difficult to identify genuine ability. This serves to reduce the contestability of the money management industry.

While this problem is an important motivation for index funds, insofar as index funds lend themselves to easier monitoring of the actions of fund managers, the pressures towards concentration of the fund industry are even more acute with index funds. The basic problem faced here is that index fund management itself is a fixed cost activity. Once computer systems are setup for managing a small index fund, the same systems scale up to much larger assets. The costs of sales and distribution costs also prove to be lower, per unit of assets, for larger funds.

This phenomenon has led to remarkably low fees for large investors: in the US market, fees of 0.01% per year are known to be prevalent for assets of $1 billion. However, this phenomenon serves to throw up entry barriers against a new firm that seeks to manage index funds. Hence we see a pronounced concentration in the index fund industry, with four-firm concentration ratios in excess of 60% (see Table 1). Each basis point of fees on a billion dollars

of assets is a revenue of $10 million. The major indexers seen in this table probably earn significant monopoly rents.

This is one negative consequence of the rise of index funds. Active management, in contrast, does not suffer from increasing returns to scale to this extent. On the contrary, many active managers view the management of large assets as being an important handicap which makes it difficult for them to obtain excess returns. There is empirical evidence suggesting that the ``optimal" size for a growth fund in the US is around $1.5 billion, the ``optimal" size for a value fund in the US is around $500 million and the ``optimal" size for a blend fund in the US is around $2 billion (Indro et al., 1999). These modest sizes are in sharp contrast with the index fund industry, where extremely large funds dominate.

6. Index funds in developing countries

In the context of a developing country, the four central questions concerning index funds are:

- Are index funds relevant in developing countries, given the prevalence of inferior market efficiency?
- Are the benefits of index funds inaccessible in developing countries owing to the greater tracking error that is faced owing to illiquid stock markets?
- What implementation strategies should be adopted for index funds in developing countries?
- What can developing countries do in order to better benefit from the supply of risk capital through index funds?

6.1 Are index funds relevant?

Most studies on the returns from active management use data for OECD countries. While accurate measures of the size of the indexation industry do not exist, the available evidence suggests that 88% of existing indexed assets are located in the US alone. To what extent do the arguments and evidence about index funds - that are well-established in OECD countries - scale to developing countries?

Research in recent years supports the idea that there are significant differences in the character of price processes in emerging countries as compared with those seen in OECD countries. Emerging markets are considered to have higher volatility, higher long-term returns, higher transactions costs, and greater predictability (Bekaert et al., 1998). If market efficiency in developing countries is systematically inferior, then there may be greater opportunities for active managers to add value in the fund management process. Hence, the case for indexation may not readily scale from OECD countries to emerging markets.

6.1.1 Theoretical arguments

At a basic level, there are three aspects, where developing countries differ from OECD countries, which could lead to inferior market efficiency:

Information access Inferior disclosure laws, and an ill-developed information business,imply that information access in developing countries is inferior.

Human capital Inferior human capital may imply there are fewer economic agents who can arbitrage away mistakes in observed prices.

Transactions costs Market mechanisms in developing countries often impose high transactions costs, so that what appears to be a breakdown of market efficiency at a statistical level is actually not a profit opportunity. To the extent that inefficiencies are not exploitable, net of transactions costs, market efficiency *holds*, in an economic sense. The efficient markets hypothesis is only a statement about the absence of arbitrage opportunities in an economy populated by rational, profit-maximising agents. To quote Jensen (1978), ``an efficient market is defined with respect to an information set Ft if it is impossible to earn economic profits by trading on the basis of Ft."

If these three factors are at work in producing inferior market efficiency in developing countries, it does not necessarily imply that active management is a superior alternative. If information access is poor, then active managers would similarly suffer from the lack of information. The inadequacy of skills in the financial sector in a country would equally apply to firms which seek to do active management, as they apply to individuals engaging in stock speculation. It is not clear that active managers would somehow be able to tap into superior human capital. Finally, if market inefficiencies exist owing to high transactions costs, these inefficiencies are not profit opportunities for active managers.

Section 2.2 showed an important motivation for indexation: the agency problems between investors and fund managers. These problems are present to a greater extent in developing countries, where institutional development is inferior, and law enforcement in the financial sector is highly limited. This is a particularly important motivation for indexation in developing countries where the institution of the corporation, and the mechanisms for overcoming principal-agent problems between investors and fund managers, are ill-developed.

When a pension committee has to make decisions on behalf of workers, in developing countries, the risk of a poor decision by the pension committee owing to ethics lapses is acute, and indexation is correspondingly attractive even if the index is not ex-ante mean variance efficient.

6.1.2 Empirical evidence

If the above arguments are sound, then the empirical evidence should favour index funds in developing countries also. Empirical testing in this area suffers from several constraints, notably the lack of a well defined ``emerging markets benchmark", and the short time-series.

The evidence in Table 5 suggests that 73% of equity funds that invest outside the US

underperform a benchmark index, and 88% of funds which invest in `emerging markets' underperform the index. These fractions are not particularly different from those seen with index funds in OECD countries.

Table 11. The value added by active management

This table summarises the evidence of Muralidhar & Weary (1998) on the performance of active managers in various asset classes. For each asset class, it reports the average extent to which fund managers outperformed the benchmark (net of fees), the tracking error with respect to the benchmark, and the average information ratio (annualised excess return divided by tracking error). For categories marked with a *, the evidence pertains to five years (12/92 to 12/97); for other categories it pertains to a ten year period (12/87 to 12/97).

	Performance of active managers			Benchmark
Asset Class	Returns	Tracking error	Information ratio	Index
US Large Cap	0.42%	4.8%	0.0	S&P 500
US Mid Cap	+0.91%	6.9%	0.3	S&P Midcap
US Small Cap *	+2.94%	8.9%	0.4	Russell 2000
Non-US Eq. *	+4.00%	10.5%	0.4	MSCI EAFE
Non-US Eq. *	-0.15%	6.5%	0.0	EAFE - Lite
Emerging Mkts Eq. *	+1.90%	8.4%	0.3	MSCI EMG Free

Source: Muralidhar & Weary (1998)

These results, from Table 5, should be interpreted with caution since the data series only runs from 1993 to 1995. In a recent working paper, Muralidhar & Weary (1998) summarise the evidence on active management in various asset classes. Their results are summarised in Table 11. For example, for the US Large Cap sector, they find that the average manager underperforms by 42 basis points, net of fees, and imposes a tracking error of 4.8% on the investor.

For non-US equity, we see significant value added by active managers when the MSCI EAFE index is used. However, if the ``EAFE - Lite" index is used (which attaches a lower weight to Japan), the excess returns vanish.

For emerging markets equity, Muralidhar & Weary (1998) have evidence over a somewhat longer period, from 1992 to 1997. Using the MSCI EMG Free index, they find that active managers add value to the extent of 190 basis points per year, at the price of a tracking error of 8.4%. However, this evidence does not necessarily imply that active management is a superior strategy in emerging markets, for the following reasons:

As Muralidhar & Weary (1998) point out, all their evidence is somewhat biased in favour of active management owing to the selection bias, where the funds who survive for the full span are likely to be the funds with better returns. They describe empirical evidence which suggests that correcting for this selection bias reduces the apparent returns of fund managers in the EAFE

universe by 170 basis points per year.

The MSCI EMG Free index is not well established as a sound benchmark covering the emerging markets universe (for example, see Masters (1998)).

From a sponsors point of view, the tracking error is also an important concern. When a sponsor hires an active manager in this universe, the one-year returns (relative to the benchmark) could lie between -14.6% and +18.4%. This poses significant risks for the sponsor.

The average excess return seen here is a mean of a small sample of 33 fund managers. In an environment with high background noise (the weaknesses of the MSCI EMG Free index, and the high tracking error), the statistical precision of this average could be limited.

This environment, with a high tracking error, makes it difficult to select an active fund manager, and exposes the sponsor to the agency conflicts discussed in Section 2.2. In this sense, the ex-post average excess returns of fund managers in this asset class are not easily identifiable in an ex-ante sense.

James et al. (1999) have a set of regression equations where the net return of funds investing in various asset classes are explained by a variety of explanatory variables. The explanatory variables used here are: assets, squared assets, number of shareholders, assets in fund complex, three-year standard deviation of returns, a dummy variable if targeted at institutional investors, the size of the initial investment, variables about loads and 12b1 fees (in the US), turnover, a dummy variable for ``bank advised", the age of the fund, and a dummy variable if it is an index fund. The dataset used here is drawn from the Morningstar database.

Table 12. The coefficient of the ``index fund" dummy in cross-sectional regressions explaining fund returns

James et al. (1999) have a set of cross-sectional regression equations explaining the returns of funds, by asset class. This table shows the coefficient of the dummy variable ``Index fund" in these models.

	US			
	Large cap	Small cap	Intnl.	Emerging Mkts.
Coefficient of ``Index"	+2.61	-1.27	-3.57	-3.72
t-statistic	4.26	-0.45	-1.29	-0.39
Number of funds	580	218	480	96
Adjusted R^2	16.94	11.04	8.79	30.34

Source: James et al. (1999)

Table 12 summarises the evidence that these regressions offer on the ``Index fund'' dummy variable, after controlling for all the other variables described above. This shows negative coefficients in three sectors: US small caps, International, and Emerging markets. However, none of these coefficients are statistically significant.

These results are somewhat biased against index funds insofar as the dataset suffers from selection bias. However, the numerical results do suggest that the null hypothesis - that the average returns from index funds are similar to the average returns from active management - cannot be rejected. This is in contrast with the US Large Cap asset class where this hypothesis can be conclusively rejected in favour of the idea that index funds yield higher returns.

6.2 Are index funds feasible?

Some observers have expressed concerns that the inferior stock market liquidity, and the weaknesses of stock market indexes, in developing countries will lead to significant tracking error in index funds.

The evidence in Table 8 suggests that program trading on some stock market indexes in developing countries is feasible; though the basket size which can be obtained in a day is obviously much smaller than that seen in the US. Index funds in developing countries are likely to be formed of much smaller assets than those seen in the US, hence this is not a key constraint. In India, IDBI Mutual has an index fund on the NSE-50 index, which has an annualised tracking error of 0.35%.[10]

6.3 How should index funds be implemented?

Developing countries are characterised by significant concerns about stock market liquidity, low skills in modern financial economics, and ill developed derivatives markets.

The concerns about stock market liquidity would emphasise caution in terms of being able to execute program trades on the index basket. In developing countries, it is not safe to make assumptions about reliably trading even the stocks in the largest quartile. For example, the IFC India index, which is not conscious about market impact cost in program trades, suffers from a market impact cost which is 82% worse than that of the NSE-50 index, when doing program trades of Rs.20 million.

The weakness in skills in modern financial economics suggests that optimisation-based procedures may be hard to implement. Even if skills and software were to be transplanted from external sources, the factor models that are required for these optimisation-based procedures are typically based on the research literature going over decades. Such knowledge is typically not available in the literature in a developing country.

The weakness in index derivatives suggests that index derivatives would not play an important role in implementing index funds.

Hence, the simplest situation is one where an index fund is implemented using full replication, and the index is free of stocks which are disproportionately illiquid. The methods of Shah & Thomas (1998), described in Section 3.1, are designed to produce an index which suits

these needs.

For countries which already have index derivatives, index funds which use full replication can greatly benefit, on the margin, from using a liquid index futures market. Index options can be used to construct a variety of guaranteed return products (Mariathasan, 1997).

In each country, a research program on models of asset pricing would create the knowledge and understanding of factor models which would lead to optimisation-based procedures in the future.

6.4 What can policy makers do to enable index funds?

The primary role that policy makers can play, in enabling index funds, is in terms of building the institutional infrastructure which helps index funds. This runs over the issues of index construction, electronic trading, program trading, call auctions, and index futures that are discussed in Section 4. From the viewpoint of pension reforms, to the extent that equity investment by pension funds is channeled through index funds, it would generate greater development of human capital in this area, and generate a constituency for the reforms which would lead to this market infrastructure.

7. Pension investment in equities

In this section, we link up the ideas presented above more directly into the questions and concerns of pension investments.

7.1 Harnessing the equity premium

The basic motivation for equity investment by pension funds is based on the 'equity premium', the excess expected returns that is offered by the equity market (Siegel, 1998). On seventy-year horizons, for which stock market indexes are observed in OECD countries, the real rate of return on the equity index is around five to six percentage points in excess of the real rate of return on fixed income investments. The existence of the equity premium is consistent with economic theory - where investors who bear the risk of non-diversifiable fluctuations should be compensated with a premium in the form of higher expected returns - however the size of the premium seems to be difficult to explain (Siegel & Thaler, 1997; Mehra & Prescott, 1985).

The equity premium provides a powerful justification for pension investment using equities, particularly when considering the long time horizons faced in pension investment. Over a thirty-year horizon, investing at 1% in real terms (a typical fixed-income asset) yields a return of 35% while investing at 6% in real terms (a typical stock market index) yields a return of 474%.

The empirical evidence about the equity premium is entirely based on the growth of stock market indexes observed over past decades. Hence, investment in the equity index is a direct method of translating this evidence into an investment strategy. The viability of index funds, and their ability to operate at fairly low levels of tracking error, suggests that this is indeed a feasible investment strategy.

7.2 The "active management premium"

More generally, we could ask the question: can an actively managed fund result in the core equity premium (the returns to the index) and an additional ``active management premium"? The empirical evidence (Table 4 and 5) seems to suggest that we cannot reject the null hypothesis that the ``active management premium" is zero.

The issues discussed in Section 2.2 are particularly important in the context of pension investment, and serve as a motivation for favouring index funds even if the ``active management premium" was positive.

7.3 Sophistication of workers

In individual-centric programs, most workers are not sophisticated in understanding performance evaluation of money managers. They are ill-equipped to consume the results of performance evaluation and hire the fund manager with the best ability.

7.4 Three-layered agency problems

If a layer of intermediaries - in the form of a pension committee - is introduced, then we would have a two-tiered agency conflict, where workers would need to devise institutional mechanisms to encourage committee members *and* fund managers to work in the best interests of workers. Devising incentive-compatible arrangements in this situation is not easy.

In either scenario, index funds offer a way to sidestep these problems by offering clear accountability, while staying in tune with the basic goal of pension investment in equities, which is to harness the equity premium.

7.5 Political risk of investments in equities

Many observers have commented on the quasi-nationalisation that might be implicit in large-scale pension investments in equities. It is easy to imagine that 50% of the GDP of many countries could be invested in equities. In this case, there is a political risk where government could use this control for political ends. This is particularly important in countries which do not use individual accounts or give workers a choice of the fund manager.

By limiting the discretion with fund managers, index funds are a way to reduce this political risk. If pension investments exclusively took place through index funds, then fund managers would have very little discretion about how they would pick stocks.

8. Conclusion

In conclusion, index funds are an important investment strategy for investors who seek to harness the equity premium. The case for index funds has often been phrased in terms of market efficiency, and the observed inability of active managers to outperform the index over long periods of time. In addition, the agency conflicts between investors and fund managers are also an important motivation for index funds, which benefit from simple and unambiguous accountability.

The equity premium gives us a powerful motivation for equity investment by pension funds. In this context, index funds make it possible to sidestep the complexities of forming contracts and monitoring institutions to govern fund managers.

In developing countries which seek to use index funds in pension investment, there are avenues through which policy makers can improve the viability of index funds. The issues faced here are primarily those of market mechanisms used on the equity market, and the construction of the market index. In many countries, there are significant avenues for improvement in these areas, which will benefit market efficiency at large, and the viability of index funds in particular.

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Notes

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[3] The concept of an "emerging market index" appears to have many difficulties as of yet (Masters, 1998). Related evidence, for a comparable five-year period, is shown in Table 6.

There are fewer conceptual difficulties faced with a stock market index pertaining to one country. Many countries have yet to embark upon large-scale international diversification as a part of their pension reforms. The local stock market index is obviously best suited to purely domestic performance appraisal.

However, much of the empirical evidence about the performance of active managers (for example, Table 11 ahead) is derived from internationally diversified money managers. We should utilise this empirical evidence - however imperfect - while applying care in interpretation.

[4] A similar argument is found in Ambarish & Siegel (1996).

[5] There is empirical evidence which suggests that active managers produce inferior returns when assets under management cross a certain threshold (Indro et al., 1999). Hence, if size is used as a signal of ability, and a sponsor is biased towards selecting the largest of funds, then this could introduce a bias towards inferior performance.

[6] The ongoing management of the NSE-50 index set may be summarised as the following rules:

Every stock outside the index is screened for liquidity as follows. In a scenario where it was indeed the 51st stock in the index, program trades are simulated for buying Rs.5 million of this hypothetical index. The market impact cost faced on this stock is measured. If impact cost is below 1.5% with a 90% probability, over the last six months, the stock is considered eligible.

A stock inside the index set is deleted from the index when it fails this same test: when the impact cost on this stock (in doing index program trades worth Rs.5 million over the last six months) exceeds 1.5% with a probability of 10% or more. The largest available eligible stock is used as a substitute.

An eligible stock from outside the index displaces the smallest stock inside the index, even if the smallest incumbent stock is adequately liquid, if the incoming stock is more than thrice the size of the smallest incumbent stock.

These rules are applied every three months to govern index set changes.

[7] Liu et al. (1998) offer an exposition of this procedure. Blin (1997) is an example of applying factor models to solving this problem, of finding a ten-stock portfolio which is maximally correlated with India's NSE-50 index. Harrison (1991) is an example of applying this to obtaining an index fund in New Zealand.

[8] There is relatively little research on tracking error. Part of the problem here is that accurate measurement of transactions costs, with the market mechanisms prevalent in the US, is difficult. For example, Larsen & Resnick (1998) discuss tracking error obtained through optimisation, but assume that there are no transactions costs.

[9] For example, at http://www.utisel.com/livefeed, the market impact cost for doing index trades in India is displayed in realtime. It is calculated off the limit order book, which is publicly visible on India's National Stock Exchange (NSE), an electronic exchange.

[10] Nayak (1997) documents an experience of the first index fund running out of India, on the NSE-50 index.

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